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ABSTRACT

This study addressed whether the educational impact of a zoo visit can be enhanced through the provision of appropriate instructional supports such as preparatory trainings or orientations. One important function of the educational process, in contrast to providing direct information or skill development, is to make the learner more sensitive to the learning environment by developing motivation and increasing skills in attention and/or selective perception. This is particularly significant when dealing with experiential education settings such as zoos, because those settings tend to be unstructured and the learner is more on his or her own. The subjects, Extension 4-H agents, were either presented an orientation lecture with slides, or given a packet of orientation reading materials. The two groups visited the San Diego Zoo in November 1987 as part of the annual meeting of the National Association of Extension 4-H Agents. Both of these groups were tested against a control group. This study demonstrated that orientation sessions can serve to boost the educational effectiveness of zoos, at least in the area of knowledge gain. The orientation did not increase the strength of attitudes and values related to zoos. (MVL)

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ENHANCING THE EDUCATIONAL EFFECTIVENESS OF ZOOS

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Paper presented at the annual meeting of the

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ENHANCING THE EDUCATIONAL EFFECTIVENESS OF ZOOS

The zoo has existed for thousands of years as a place where people can get a glimpse of life as it exists beyond their daily experiences or national boundaries. In the past two decades, however, the importance of zoos to society has grown dramatically. As more and more of the world's wildlife becomes endangered through habitat destruction, poaching and other threats, zoos have moved to the forefront of efforts to preserve animal species and their environments. Thus one could argue that zoos are more "mission-oriented" than at any previous time in history. They approach this task through both scientific research (breeding programs, animal behavior studies, etc.) and public education.

Educational sophistication in zoo design has grown steadily in recent years, as evidenced in the more innovative zoos by projects such as the simulation of natural environments (e.g., the rainforest or African savannah), the grouping together of compatible species, and the creation of interactive exhibits and unique viewing areas. However, very scant attention has been paid to what, or how, people learn from their zoo visits. Evaluative information, when addressed, takes the form of attendance figures, viewing behavior patterns, or immediate feedback surveys (Churchman, 1985). Educational impact, in terms of the growth of knowledge or values, has not been well-studied.

The need for such impact studies is beginning to be

recognized (e.g., Landers, 1988), but an ERIC-based literature search over the past five years yielded essentially no research reports on this topic. Admittedly, formal studies of impact would appear to be difficult to implement because of the diversity of the zoogoing population, the unstructured nature of most zoo visits, and the problems inherent in imposing formal educational treatments on the casual zoo visitor. Nevertheless we believe that they should, and probably will, be given more attention in the near future.

The present study addressed whether the educational impact of a zoo visit can be enhanced through the provision of appropriate instructional supports, i.e., through preparatory trainings or orientations. One important function of the educational process, in contrast to providing direct information or skill development, is to make the learner more sensitive to the learning environment by developing motivation and increasing skills in attention and/or selective perception. This is particularly significant when dealing with experiential education settings such as zoos, because those settings tend to be unstructured and the learner is more "on his or her own."

This is the concern of the present study. We produced two formats for a short, readily implementable orientation session targeted for adults, and tested them for their subsequent impact on subjects' knowledge and attitudes. We were fortunate in being able to conduct the research in conjunction with a national conference, which increased the study's experimental rigor.

Method

Setting and subjects. The setting for the study was a group trip to the San Diego Zoo in November 1987 as part of the annual meeting of the National Association of Extension 4-H Agents. Persons attending the conference were professional youth workers associated with the 4-H program from across the United States. Most of the conference participants were county-level program staff, although a few worked at the state or national levels.

The conference ran from Sunday night through Friday, with the visit to the zoo occurring on Tuesday afternoon. Within the full conference sample, there were no selection biases influencing the opportunity to visit the zoo. The visit was regarded as a conference highlight, and no other conference activities were scheduled at that time. The great majority of conference-goers participated in the visit. Buses transported them to and from the zoo. The visit lasted about four hours.

The research aspects of the zoo visit -- i.e., the administration of three different treatment conditions, the random assignment of participants to treatment condition, and the testing of participants -- were conducted as part of a research demonstration for the conference itself. Thus the presence of an educational research study was known to the participants. Data were obtained for 648 subjects.

Educational treatments. The educational treatments, which consisted of the presentation of orientation information, were geared toward enhancing the zoo visit's educational value. Two

separate treatments were developed: a lecture presentation and a reading materials packet. The educational content of these treatments was kept as similar as possible, to ensure that the differences between them were primarily variations in format and delivery rather than in substance. The educational content focused on background and behind-the-scenes information about zoos, especially the San Diego Zoo, and their work in education and species preservation. Examples of individual vignettes included the rescue from extinction of the Arabian oryx and the training of a gorilla raised in captivity to be a successful mother. The information also included mention of the major exhibits at the San Diego Zoo on display at that particular time, such as the giant panda and golden monkeys.

The orientation presentation (Treatment A) was a lecture supported by accompanying slides. It lasted one hour and was presented by the first author in an auditorium setting on the morning of the zoo visit. The lecture was presented twice, in successive hours, to allow for variation in schedules and ensure as high an attendance as possible. To make sure that the lectures were identical, the presenter read from a script.

The reading materials packet (Treatment B) was distributed several days ahead of time so that participants would have an opportunity to read it. Most of the packet consisted of one- and two-page articles from the San Diego Zoo's educational newsletter publication, on the same topics as the lecture. The remainder of the packet addressed important topics not covered in the Zoo's

articles and provided perspective for the scheduled visit.

The two educational treatments were tested against a control condition, in which participants were given no orientation materials of any kind. Thus the study had three treatment conditions in total.

Measurement instruments. The pretest measures were combined into one questionnaire, designed for administration in a single sitting. Pretest measures included the following: (a) an eight-item knowledge test taken directly from exhibits at the San Diego Zoo, (b) a number of demographic and self-descriptive items (including age, gender, educational level, geographical home, proximity to a zoo, previous zoogoing behavior, etc.), and (c) several attitude scales -- attitude toward zoos, attitude toward animals, and attitude toward the use of zoos in 4-H. The attitude scales consisted of seven-point Likert items and ranged in length from 5 to 11 items.

The posttest included: (a) a 16-item knowledge test, also consisting of information taken directly from the Zoo's exhibits but differing from the pretest items, (b) the attitude scales that were present on the pretest, and (c) a scale of how time was spent during the zoo visit. A sample item from the knowledge posttest is:

The secret of the kopje's variety of life is related to:

a. regulation of temperature.
b. soil nutrients.
c. storage of water.
d. inaccessibility to man.

A sample item from the attitude toward zoos scale is:

> *I favor my local government spending money to support the existence of zoos.*

A sample item from the attitude toward zoos and 4-H scale is:

> *Zoos can be a significant resource for my local 4-H program.*

The reliability of the scales, expressed as Cronbach's alpha coefficients, were as follows: knowledge posttest, .56; attitude toward zoos, .82; attitude toward zoos and 4-H, .77.

Treatment assignment procedure. A systematic assignment procedure was used to determine which subjects would be included in each treatment condition. Three different sets of instruction envelopes were produced, each one containing information specific to one of the treatment conditions. These envelope types were inserted, in alternating order, into the conference registration packets. Limitations in time and research personnel made it impossible to keep a list of conference attendees and their treatment assignments, so the latter information was retrieved as an item on the posttest.

Each packet contained a cover sheet stating the subject's treatment assignment, as well as other necessary information. The Treatment A packets listed the two times at which the orientation lecture was being offered, and strongly encouraged attendance. The Treatment B packets included the orientation reading materials, along with encouragement to look them over by the Tuesday visit. The Treatment C packets simply encouraged subjects to attend the zoo visit and have an enjoyable time. All

packets included minimal background information on the research project, so that subjects would be prepared for the requests to complete pre- and post-measures. This background information also strongly encouraged participants not to expose themselves to the treatments other than their own.

Testing procedure. The conference planners were very supportive of the research effort, and allowed time for pre- and posttesting at the most convenient times possible. The limited number of times for which conference participants were scheduled to be physically together placed a moderate degree of constraint on the options for test administration.

The pretest was administered at the conference's first dinner, on Sunday evening, which was provided for all attendees. The posttest was administered in the buses returning from the zoo. Administering the posttest at this time provided greater coverage of subjects than any other administration setting in the remainder of the week. For each bus, one person had been previously designated as test administrator and given appropriate instructions for directing the administration.

Results

Table 1 presents demographic characteristics of the subject sample. As the table shows, the sample was primarily female (65%) and between the ages of 25 and 44 (68.8%). Subjects were well-educated, with 64% having a masters degree or beyond. All geographical regions of the country were represented, with the

Northeast being somewhat underrepresented (15.5% of sample) and the South somewhat overrepresented (36.9%). (The four geographical regions stated in the item refer to the association's organizational structure, with which participants were familiar.)

Table 1 also presents background information on subjects' familiarity with zoos. Most subjects lived at some distance from the nearest zoo (47.2% lived more than 50 miles away). They tended to be infrequent zoogoers, with 61% reporting no visits to a zoo in the year past, and 31% reporting their last visit to be more than three years before.

Table 2 displays information on the number of subjects who actually received each treatment, crossed with their original treatment assignment. Thus these figures refer to treatment fidelity or "capture rate." The data are based on self-report, deriving from posttest items that dealt with the respondent's treatment assignment and subsequent exposure to the various treatments. Among subjects initially assigned to Condition A (lecture), 79.5% of them (163 out of 205) reported actually attending the lecture. Among those assigned to Condition B (reading packet), 73.2% (139 out of 190) reported actually reading the packet. Furthermore, only 3.6% (16 out of 439) of those subjects <u>not</u> assigned to Condition A reported attending the lecture anyway, and 10.2% (46 out of 451) of subjects <u>not</u> assigned to Condition B reported reading the packet anyway. We consider these figures to be highly satisfactory. The amount of

treatment slippage in a research study is often much higher, especially for studies characterized by an "invitational" treatment such as this (e.g., Campbell, 1971). A caveat is that this fidelity assessment is based on confidence in the self-report procedure. However, given the present setting, we consider the demand characteristics that might lead to subjects' lying to be extremely low.

In our data analyses we considered each subject's treatment membership to be that to which s/he was originally assigned, rather than that in which s/he actually participated. Thus, a subject who was assigned to Condition A but did not attend the lecture would still be considered as a member of Treatment A anyway. This is a conservative data analysis procedure, since it means that people who did not follow their treatment instructions are being counted as if they did (while people in the control group who may have attended the lecture or read the packet are being counted as if they had no exposure to the materials). Although conservative, this strategy is the most appropriate option, since the creation of the experimental groups involved the <u>invitation</u> to participate rather than participation itself. Actual subject compliance with this invitation is a self-selected variable, and thus inappropriate for statistical analysis.

Besides this statistical justification, there is also an educational justification for basing the data analysis on treatment assignment rather than treatment participation. A successful educational treatment is, in part, one to which

learners are attracted and wish to participate. A treatment that attracts only half of its intended audience is less successful than one that attracts more, all other effects being equal.

Table 3 displays differences between the three experimental groups on the pretest subscores. This analysis supports the initial equivalence of the groups. However, the analysis should be considered approximate since this sample is not identical to the full posttest sample. It includes only those subjects who provided information linking their pretest scores to their posttest scores. (Treatment assignment information was collected only on the posttest.)

The most important posttest variables for which growth was targeted in the educational treatments were knowledge gain, attitude toward zoos, and attitude toward zoos' potential in 4-H youth work. Analyses are reported for these variables in Tables 4 through 7. Table 4 shows N's and treatment group means for each of the major dependent variables (Knowledge--orientation and knowledge--incidental are explained below).

As Table 5 shows, differences in the knowledge posttest scores between each treatment group and the control group were highly significant, with both the orientation lecture and the reading packet producing higher group means ($p<.001$ in both cases). The differences between groups on the attitude scales (group means listed in Table 4) were not significant. (The analysis of variance information is not displayed.) Thus the treatments produced gains in information learned but not in

attitudes.

The fact that the treatments produced higher knowledge scores is impressive, but closer consideration indicates that the orientations themselves may have produced this gain, rather than making the zoo visit more educationally valuable. To explore this line of thinking, we created two subscales from the overall 16-item knowledge scale. The knowledge--orientation subscale consisted of items whose answers were contained in the orientations, while the knowledge--incidental subscale consisted of items whose answers could be found only in the zoo exhibits. Since the orientations were parallel in content, this subscale split was identical for each of the two treatments. As noted above, Table 4 shows the group means on the two knowledge subscales. Table 6 shows the ANOVA for the knowledge--orientation scale. These differences were highly significant, with both the lecture and reading packet groups scoring higher than the control group ($p<.001$). Thus, experimental subjects scored higher than control subjects on those items to which they had been exposed in the orientations. In addition, the lecture group scored higher than the reading packet group on this information, although this difference was not as great ($p<.025$).

What about subjects' incidental learning at the zoo? Did the orientations make them better learners during the zoo visit itself? Table 7 shows the ANOVA for the knowledge--incidental subscale. As the summary table shows, there is a significant difference between the three groups ($p<.05$). Analysis of the

contrasts shows that the lecture group did not score higher than the control group, but the reading packet group did ($p<.02$). Thus, the provision of a zoo orientation reading packet produced higher scores not only on information contained in the packet, but on other information as well.

Discussion

This study demonstrates that orientation sessions can serve to boost the educational effectiveness of zoos, at least in the area of knowledge gain. Their ability to increase the strength of attitudes and values related to zoos was not supported here, and will need to be explored further through other studies.

The highly significant gains in knowledge produced by each of the orientation formats in comparison to the controls is the strongest result of this study. However, the most intriguing finding may be the increase in incidental knowledge that was associated with the reading packet condition. To summarize that finding, the reading condition was found not only to help subjects learn about zoo-related topics discussed in the materials themselves, but also to become better learners during the zoo visit itself. This form of educational impact might be viewed as the ultimate purpose of an orientation session: to help the visitor attune to the displays, want to learn, or otherwise become more involved with the learning environment (whether that is a zoo or another educational setting).

Two observations lend greater strength to this finding.

First, Tables 4 and 6 show that the reading packet condition was actually less effective than the lecture condition in increasing knowledge on orientation-related subjects, as evidenced by the scores on the two subscales. The fact that it was more effective on the incidental knowledge scale stands in contrast to this. Second, as Table 2 shows (and as noted above in the Results section), only 73% of the reading packet treatment group actually read the provided materials. Thus it appears likely that the significant effect on the incidental knowledge subscale was "carried" mainly by this smaller group.

Two interpretations can be offered related to the failure of the treatments to produce changes in attitude scores relative to the controls. First, attitudes are generally acknowledged to be relatively stable entities, and require extended effort to produce change. Short educational treatments, such as those examined in this study, will probably not be able to produce change. Second, from a statistical perspective, a ceiling effect may have been operating in the data. As Table 3 shows, the attitude scores were well above the mean even at pretest, and thus there may have been too little "room" for effects to emerge.

Future research directions and conclusions

This study was only an initial attempt to explore how the educational effectiveness of zoos could be enhanced. With relation to following up on these findings, a number of future directions can be specified. First, many variations need to be

tried in the design of educational treatments, to help determine the possibilities and (perhaps) limits for educational impact. Second, research should be conducted with a wide variety of target groups, particularly children, to determine how robust these results might be across different populations. Third, studies should consider the zoos' possible impact on values and attitudes about current ecological issues; this study did not address these concerns. Fourth, other kinds of cognitive growth, apart from straight knowledge gain, should be studied. This could include forms of knowing such as application and analysis (to quote from Bloom's taxonomy of the cognitive domain).

In general, zoos need to start focusing on the educational effectiveness of their exhibits and programs. Their potential educational contribution is increasingly recognized by society as important and unique, as more species are placed on the endangered list and more educators speak of the need to inform the American public about ecological threats such as rainforest depletion, acid rain, the greenhouse effect, etc. Up to now, most information-gathering efforts related to the zoo visitor have been informal or casual. The relative lack of attention to what people learn from their visits appears, from our perspective, to stem mainly from a sense of priorities. We suspect that if more interest is expressed from sectors such as professional zoo associations (e.g., in the form of criteria for exhibit prizes) and funding sources, the research related to educational impact will quickly grow.

There are indeed logistical difficulties with conducting educational experiments (i.e., studies involving random assignment to treatment conditions) in an informal environment such as a zoo. Examples of these include the establishment of an appropriate sample, the operationalization of a "zoo visit," the need for visitor cooperation in completing paper and pencil measures or other instructions, etc. However, these difficulties can be overcome with careful planning. One important factor to take advantage of is the many group trips that are arranged to any given zoo over the course of a year, of which the present study is but one example. Communication between a zoo's educational office and the trip planners can help to resolve many of these research issues. The fact that most group trips are school groups is an advantage, since children are one of the most important audiences for zoo education efforts.

In conclusion, this study suggests that short, succinct orientations may indeed be very useful, at least in the areas of cognitive learning objectives. Perhaps more important, we hope the next few years show increased attention to exploring and describing the educational contributions that can be made by zoos and other informal learning settings.

References

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Table 1

Description of Sample at Pretest

Gender:	
Female	488 (65.1%)
Male	262 (34.9%)
Age:	
Under 25	21 (2.8%)
25-34	245 (32.5%)
35-44	274 (36.3%)
45-54	146 (19.4%)
55-64	59 (7.8%)
65 or older	7 (0.9%)
Educational level:	
High school graduate	42 (5.6%)
Undergraduate degree	228 (30.1%)
Master's degree	288 (38.3%)
Post-masters' coursework	139 (18.5%)
Ph.D.	54 (7.2%)
Region of residence:	
North Central U.S.	218 (28.9%)
Northeast U.S.	117 (15.5%)
Southern U.S.	278 (36.9%)
Western U.S.	140 (18.6%)
Approximate distance of home to nearest zoo:	
Less than 10 miles	121 (16.0%)
10-30 miles	146 (19.3%)
31-50 miles	114 (15.1%)
More than 50 miles	356 (47.2%)
Not sure	17 (2.3%)
Last time visited a zoo:	
Within past 6 months	183 (24.2%)
Between 6 months and 1 year	92 (12.2%)
Between 1 and 3 years	244 (32.3%)
More than 3 years	229 (30.3%)
Never been to a zoo	5 (0.7%)
Number of visits to a zoo in the past year:	
None	460 (61.0%)
1	177 (23.5%)
2-3	85 (11.3%)
4-6	16 (2.1%)
More than 6	14 (1.9%)

Table 2

Subject Compliance with Treatment Instructions

SUBJECTS' ATTENDANCE AT ORIENTATION LECTURE, BY CONDITION ASSIGNMENT:

	Condition Assignment		
	A: Lecture	B: Packet	C: Control
Attended lecture	163	11	5
Did not attend lecture	42	182	241
Totals	205	193	246

SUBJECTS' EXPOSURE TO READING PACKET MATERIALS, BY CONDITION ASSIGNMENT:

	Condition Assignment		
	A: Lecture	B: Packet	C: Control
Read materials	20	139	26
Did not read materials	184	51	221
Totals	204	190	247

Table 3

Group Scores at Pretest [a,b]

	N	A: Lecture	B: Packet	C: Control	Total
Knowledge pretest (number items correct out of 8)	499	3.66	3.62	3.39	3.55
Attitude toward zoos (1=lowest, 7=highest)	499	5.00	5.11	5.06	5.06
Attitude toward 4-H & zoos (1=lowest, 7=highest)	499	4.84	4.79	4.89	4.85

[a] This pretest sample is not identical to the posttest sample used in later analyses. Subjects included here are only those whose pretests could be matched with their posttests (by Social Security number). Therefore, these scores should be considered approximate indications of the posttest samples.

[b] Analyses of variance showed no significant differences between groups on any pretest variable.

Table 4

Treatment Means at Posttest

	Treatment condition			
	A: Lecture	B: Packet	C: Control	Total
N	207	195	242	644
Overall knowledge test (16 items)	8.36	8.24	6.79	7.73
Knowledge -- Orientation (8 items)	5.18	4.79	3.76	4.53
Knowledge -- Incidental (8 items)	3.21	3.45	3.03	3.22
Attitude toward Zoos (average score on 7-point scale)	5.23	5.30	5.22	5.24
Attitude toward 4-H & Zoos (average score on 7-point scale)	4.90	4.94	4.95	4.93

Table 5

ANOVA for Overall Knowledge Posttest

SUMMARY TABLE:

Source	df	SS	MS	F	p
Between groups	2	344.95	172.48	22.97	<.001
Within groups	641	4812.64	7.51		
Total	643	5157.59			

PAIRED CONTRASTS:

Contrast	Value	t	p
Lecture vs. Control (A-C)	1.57	6.05	<.001
Packet vs. Control (B-C)	1.44	5.47	<.001
Lecture vs. Packet (A-B)	.13	.46	NS

Table 6

ANOVA for Knowledge Posttest -- Orientation Items

SUMMARY TABLE:

Source	df	SS	MS	F	p
Between groups	2	244.42	122.21	41.83	<.001
Within groups	640	1869.91	2.92		
Total	642	2114.33			

PAIRED CONTRASTS:

Contrast	Value	t	p
Lecture vs. Control (A-C)	1.42	8.78	<.001
Packet vs. Control (B-C)	1.03	6.27	<.001
Lecture vs. Packet (A-B)	.39	2.31	<.025

Table 7

ANOVA for Knowledge Posttest -- Incidental Items

SUMMARY TABLE:

Source	df	SS	MS	F	p
Between groups	2	18.57	9.28	3.13	<.05
Within groups	643	1904.53	2.96		
Total	645	1923.09			

PAIRED CONTRASTS:

Contrast	Value	t	p
Lecture vs. Control (A-C)	.18	1.11	NS
Packet vs. Control (B-C)	.41	2.50	<.02
Lecture vs. Packet (A-B)	-.23	-1.35	NS